

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

P-5

METRICATION REPORT TO THE CONGRESS

January 1990

Overview

The principal NASA metrication activities for FY 1989 were a revision of NASA metric policy and evaluation of the impact of using the metric system of measurement for the design and construction of the Space Station Freedom. Additional studies provided a basis for focusing follow-on activity. In FY 1990, emphasis will shift to implementation of metric policy and development of a long-range metrication plan. The report which follows addresses Policy Development, Planning and Program Evaluation, and Supporting Activities for the past and coming year.

FY 1989 ACTIVITIESPolicy Development

In March of 1989, the Deputy Administrator of NASA assigned responsibility for NASA's metrication program to the Associate Administrator for Safety, Reliability, Maintainability and Quality Assurance (SRM&QA) and established the NASA Metrication Planning Group. The group is an agency level committee, representing the major program and functional areas within NASA, with responsibility for revising NASA's metric policy and assessing the impacts and requirements of transition to use of the Systeme International (SI) metric system.

During FY 1989, both policy and approaches to a transition plan were addressed, but the principal focus was on restructuring NASA metric policy. Although there are still unresolved concerns, such as interfaces with continuing programs such as the Space Transportation System, a draft policy was developed for full internal review.

Where possible, actions are being taken to support transition prior to establishment of a comprehensive policy. The SRM&QA office, has issued an internal policy requiring all new or revised documents issued by that office to be made compatible with use of the SI metric system, either by selection of metric units or, as an interim measure, by the use of dual units. Such measures provide a simple approach to building familiarity with the SI metric system and removing barriers to its use.

Support of governmentwide metrication continues through NASA participation in the interagency Metric Operating Committee (MOC) and its Steering Committee. The Steering Committee has provided a mechanism both for assisting the Department of Commerce (DOC) with overall planning and policy revision and for coordination of metric activities among its members. The MOC has formed subcommittees to address functional planning for metrication and NASA representatives have been named to six of the eleven MOC subcommittees. NASA has participated in meetings of the Construction Subcommittee, which has already begun to function.

Planning and Program Evaluation

The principal program evaluation activity of FY 1989 was the assessment of the feasibility and impact of changing the principal measurement system for the Space Station Freedom to the SI metric system.

A Space Station Freedom program decision was made at the end of 1989 to continue the existing policy of baselining use of the inch-pound system, while permitting use of the metric system through waivers where appropriate. Metric will be allowed in cases when it is in the best interests of the program and/or is consistent with national policy favoring voluntary metrication by industry.

The proposal to baseline the metric system, with exceptions for the use of the inch-pound system, was under serious consideration because it offered potential advantages for the long term. However, it was finally determined that the potential cost and schedule impact of this change was not acceptable at a time when program funding was being reduced and a firm program scheduled was required. Estimates of conversion costs totaled \$221 million; most expenditures would have occurred in the early years.

In retrospect, there were two key barriers to the use of the metric system in the Space Station program. The first barrier was the fact that the U.S. aerospace industry has not converted to metric units of measure in many areas. This resulted in considerable uncertainty regarding both the availability of qualified parts and the schedule impact of converting many specifications and standards to metric. There also was concern that lack of familiarity of senior design engineers with metric might result in errors with negative implications for cost and schedule.

The second barrier was the use of the inch-pound system as the standard for the first few years of the hardware procurement (Phase C/D) effort. This greatly increased the difficulty of converting to the metric system. The metric system would have been much easier to implement in the Space Station Program if it had been facilitated throughout the definition and early design/development stages of the procurement

effort.

Because the Space Station Freedom issue was the major factor in establishing a schedule for transition to full use of the SI metric system in NASA, no other program evaluation and transition schedule studies were undertaken during FY 1989.

Supporting Activities

Effectively identifying principal barriers to metrication is an important prerequisite to their removal. During FY 1989, a study was performed under contract to NASA to identify such issues and assess overall aerospace industry readiness for acceptance of metrication. Results of the study suggest that overall transition to use of the metric system in the aerospace industry is likely to be highly dependant on government initiatives (such as the LHX helicopter). Also, although some standards are available, the availability of space qualified, standard, metric piece parts was identified as a potentially critical barrier to successful transition, both in terms of cost and schedule (availability). An internal follow-on survey of this issue, was initiated in FY 1989 through an announcement in the "Commerce Business Daily" to determine the actual availability of space qualified metric parts. Due to the extensive follow up required, that study was not finished in FY 1989.

Small business was singled out by the amended Metric Act for special support during transition to full use of the SI metric system. Earlier NASA studies had also suggested that small companies might have a harder time than large companies in adjusting to use of the SI metric system. During FY 1989, a survey of independent, aerospace quality, machine shops was initiated to determine current experience with the construction of metric hardware. Although the sample was small, the results of the survey, completed in FY 1990, indicate more experience with metric tasks than expected. Metric tasks are now performed using both "soft" and "hard" metric approaches. Although there was little technical concern by aerospace machine shops with accommodating such work, the volume of demand appears to be the principal deterrent to making the investments necessary to switch to a "hard" metric approach.

Among the NASA field centers, the Marshall Space Flight Center (MSFC) remains the principal focus of localized metric activity. MSFC, in cooperation with the U.S. Army Missile Command, Redstone Scientific Information Center, developed a bibliography of metric studies to serve as an information resource for program development. In cooperation with the Alabama State Metric Coordinator, the center again initiated a state proclamation establishing a "Metric Awareness Week" in the State of Alabama. The center provided updated exhibits, scheduled lectures and distributed metric information both at the center and for center contractors, local agencies, educational facilities, the Alabama Space and Rocket Center and local newspapers.

PLANNED FY 1990 ACTIVITIES

Policy Development

Internal review and issuance of a NASA metric policy is a top priority for FY 1990. Attention will then turn to development of implementing instructions and establishment of a planning process involving both the major program offices and the NASA field centers.

Planning and Program Evaluation

A framework for the overall NASA Metric Transition Plan will be established and individual planning activities initiated within selected program offices. Compatibility with continuing programs such as the Space Transportation System and a non-metric Space Station Freedom will be an important factor in determining a schedule for eventual transition to use of the SI metric system. Attention will be given to the possibility of small scale "pathfinder" projects to identify serious impediments to metrication.

Supporting Activities

Surveys of metric capabilities already in place will be initiated in FY 1990 to provide a baseline for the transition plan.

A metrication initiative in metrology is being formulated and preliminary contact has already been made with the National Institute of Standards and Technology (NIST) regarding cooperative efforts.

The design implementation guidelines developed during the Space Station Freedom evaluations, and referred to in last year's report, provide a starting point for establishment of an agencywide guideline to metric practice.

Requirements will be established for metric training programs adapted to NASA needs, although maximum use will be made of governmentwide training programs now being handled through the Interagency Metric Operating Committee.

Progress in these and other functional areas will rely strongly on interagency planning and cooperation through the subcommittees of the Metric Operating Committee. Although NASA retains responsibility for transition of its technical program, reinforcement of functional capabilities at the interagency level will remain an important factor in achieving the momentum necessary for transition to full use of the metric system.